

## News Briefs

## \*Teachers nominated

The Council of Chief State School Officers has announced 114 nominees from among elementary and secondary school teachers for the NASA Teacher in Space Project. The nominees were drawn from 10,000 applicants from the 50 states, US territories, Defense and State department overseas schools and Bureau of Indian Affairs schools. Following a June workshop in Washington, 10 semifinalists will be selected from whom Administrator James Beggs will pick primary and backup candidates for a Shuttle flight early in 1986.

## \*Solar power in Africa

Solar-power community services have been installed in four Gabon villages under management by the NASA Lewis Research Center. The systems power dispensary refrigerators, submersible well pumps, school videocassette players and public lighting. The photovoltaic arrays have a combined capacity of 12.1 kilowatts and charge storage batteries during daylight hours. The project is funded by the US Department of Energy and the Republic of Gabon Ministry of Energy and Hydraulic Resources.

## Inventors honored

NASA has given its 1984 Inventor of the Year award jointly to Dale M. Kornfeld of Marshall Space Flight Center and to John W. Vanderhoff, Mohammed S. El-Asser and Fortunato J. Micale, all of Lehigh University, for their work on the "Process for Preparation of Large-Particle Size Monodisperse Latexes." Kornfeld and Vanderhoff each received \$2500, and El-Asser and Micale, \$2000 cash awards at a Headquarters ceremony. The Monodisperse Latex Reactor Processor, an experiment flown aboard Shuttle, has produced microspheres in zero gravity ranging in size from 5 to 30 micrometers and with uniform quality. The microspheres are used in calibrating sensitive instruments such as microscopes, filters and particle counters, in identification of cancer and glaucoma, and in manufacturing of finely-ground products such as paint pigments, inks, toners and other powder materials.

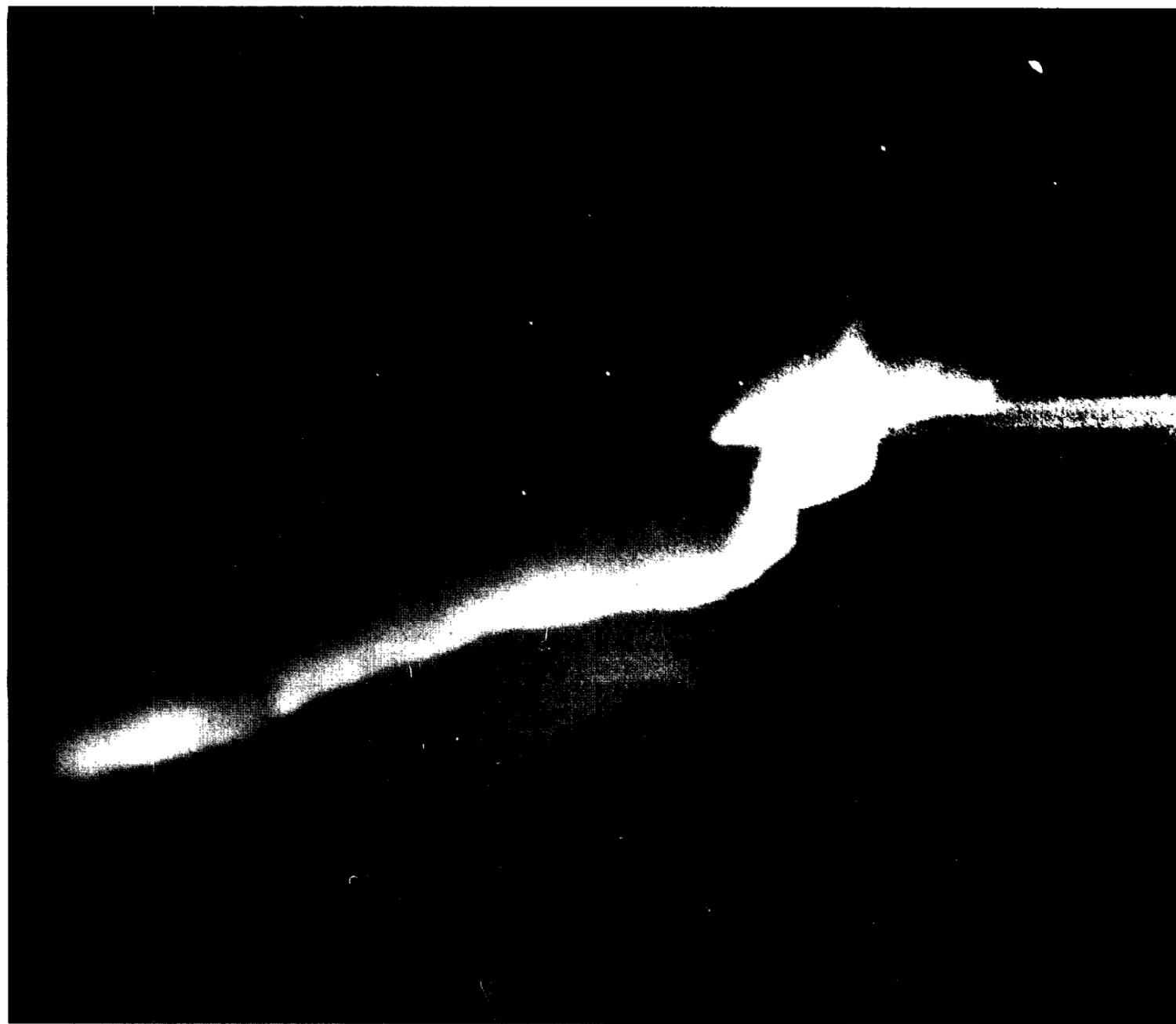
## Other Griffin heads space wing

Col. Richard L. "Larry" Griffin has been named commander of the USAF Space Command's 2nd Space Wing scheduled for activation in July at Falcon AFB, Colorado. He was formerly at JSC as assistant to twin brother Gerald Griffin before assignment in July 1984 to the newly-formed Space Command at Peterson AFB, Colorado.

## About submissions...

Civil Service and contractor employees interested in advertising in the Roundup Swap Shop are reminded that submissions must be placed on a JSC Form 1452, available from the Forms Office, Distribution Operations. The one group excepted from this rule is NASA retirees, who may submit the ads as always, preferably on an 8 1/2 x 11 sheet of paper. For all other advertisers, a Form 1452 is necessary, and can be obtained through normal requisition procedures. The cooperation of our advertisers in following these guidelines is greatly appreciated.

# Spacelab 3 flight brings back heavy science data load



Fast color film fails to do justice to the Aurora Australis display seen by the Spacelab 3/51-B crew in the south polar regions. Geomagnetic

storms cause energetic particles in the earth's atmosphere to glow.

More than 250 million bits of data on 15 Spacelab 3/51-B experiments were brought back to principal investigators when *Challenger* landed after seven days in orbit. One of the principal investigators, JPL's Dr. Taylor Wang, became the first PI to fly with his experiment.

The flight also produced the first crystal grown in space from fluids. Payload specialist Lodewijk van den Berg, who operated the Materials Science Experiments during the flight, said, "We hope the crystals are as good as they obviously look."

The returned crystal will be analyzed for its value in X-ray and gamma ray detectors used in scientific, medical and industrial applications. Grown from a "seed" crystal, the mercury iodide crystal grew to the size of a sugar cube over the 104 hours the experiment was activated.

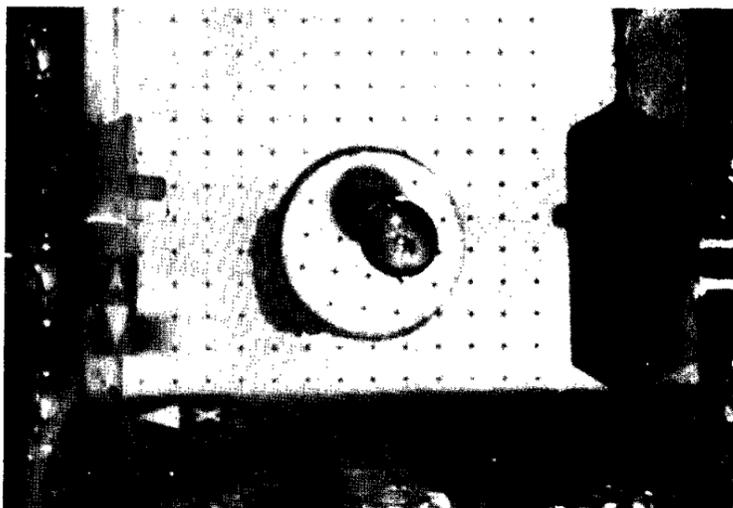
More than a half million video images and photographs were recorded of Aurora Australis for the auroral imaging experiment. Spacelab 3's 57-degree inclination carried the vehicle over the south polar geomagnetic display.

Designer-operator Wang had to perform some inflight maintenance on his drop dynamics mod-

ule hardware before he could gather data on behavior of free-floating fluid in microgravity. Zap-

the dynamics of drops splitting," said Wang.

A menage of two squirrel mon-



A fluid sphere hovers in Dr. Taylor Wang's drop dynamics module, its motion modulated by ultrasonic waves directed at the sphere from varying directions.

ping the fluid sphere in the experiment enclosure with ultrasonics, Wang made the fluid ball go through some strange gyrations—including an unexpected split of the fluid after a spin-up. "I am very excited about our findings in

keys and 24 rats in an animal holding facility quickly adapted to zero gravity, except for one monkey who experienced malde-espance early in the flight. The human crew adapted more slowly to animal food and fecal dust

drifting free in Spacelab and migrating through the tunnel to *Challenger's* crew cabin.

"When the cage door was opened," said mission specialist Dr. Bill Thornton, "positive pressure in the enclosure sent particles flying all over." The crew used the onboard vacuum cleaner and other means to corral the particles.

The two major setbacks on the flight were the failure of the Global Low Orbiting Message Relay Satellite (GLOMR) to deploy from its payload bay getaway-special canister on day 1, and the failure of the Spacelab scientific airlock outer hatch to open for the Very Wide Field Camera. The cause of the jammed hatch appears to have been a bent latch handle.

Flight commander Bob Overmyer said there "was no apparent reason for GLOMR not to deploy."

*Challenger* landed at Edwards AFB Runway 17 May 6 with a rollout of 8300 feet. Some 20 of *Challenger's* heatshield tiles will be replaced at KSC along with blanket insulation on the left orbital maneuvering system pod which peeled back during launch. Brake damage was limited to three cracked rotors on the left main landing gear. The tires appeared to be undamaged.

## Bulletin Board

### Engineering to sponsor expo in June

Again this year, the Engineering Directorate will hold an exposition at the Gilruth Recreation Center. Each division will display, demonstrate and explain various hardware and software developments. On display will be such developments as a voice command system to remotely control television cameras, a Space Station control module mockup, a full scale Spacelab mockup and a variety of other wizardry. The exposition will be open to all employees in the JSC community and their families. The expo will run from 4 p.m. to 9 p.m. June 5 and from 8:30 a.m. to 4 p.m. June 6.

### Brown Bag Seminars scheduled

Upcoming presentations at the weekly Brown Bag Seminar in May and June include a look at orbital debris and a discussion about the University of Texas "Big Eye" 300-meter telescope. The seminars are held every Wednesday from noon to one in Bldg. 31, Room 193. On May 22, a videotape describing the eruptions of Mauna Loa will be presented. On May 29, Don Kessler and D. Schramm will discuss recent measurements of orbital debris impacts on material taken from the Solar Max satellite. On June 5, Drew Potter will discuss Fraunhofer line measurements of the Moon and planets. Pat Rawlings of Eagle Engineering will present some of his space artwork June 12. The June 19 meeting will be an open discussion of the Strategic Defense initiative program. On June 26, Dr. Harlan Smith of the University of Texas will show a videotape and discuss UT's "Big Eye" telescope. For more information, call Al Jackson at 280-2285.

### BAPCO to meet May 21

BAPCO, the local IBM-PC users group, will hold its next monthly meeting at 7 p.m. Tuesday, May 21, at the Sheraton King's Inn on NASA Road One. BAPCO meets regularly the third Tuesday of each month. For more information, call Earl Rubenstein, x3501, or Hattie Thurlow, x2213.

### HSO to present the Boston Pops

Conductor John Williams and the Boston Pops will stop in Houston for a one concert performance at 8 p.m. July 22 in Jones Hall. The concert is being presented by the Houston Symphony Orchestra. The appearance is part of a 15-city transcontinental tour planned by the Boston Pops organization in celebration of its 100th birthday season. Tickets range in price from \$10 to \$30 and will go on sale June 3 in the Houston Ticket Center at Jones Hall, at all Ticketron outlets and Joske's stores.

### Youth Center dinner-dance set

It has been 20 years since the flight of GT-4 when astronauts McDivitt and White opened their door and White took that first step out into space. White received the \$500 Haley Award from the AIAA for his accomplishment and he then put this "seed" money in a trust to be used for the construction of a youth center for this area. After the Apollo fire, the Ed White Memorial Youth Center was built in Seabrook. On May 25 a dinner/dance, called Space Walk '85, will be held at the Gilruth Center to commemorate this 20th Anniversary. White's son and his family are coming from New York, several of the early astronauts are planning to attend, and the ContraBand Swing Band will provide the music. If you would like to attend, call the Youth Center at 474-2853 for information.

## Gilruth Center News

Call x3594 for more information

**Intermediate advanced shorthand** — In this course you will learn the basics of reading and writing Gregg shorthand. Work includes speed building. Bring a shorthand notebook and pen to class. This six week course will be held from 5:30 to 8 p.m., starting June 12. The cost is \$85 per person.

**Word processing** — Learn about wordstar and how to apply it to IBM, Apple and other computers. Emphasis will be on legal letters, resumes, etc. This six week course will meet from 5:30 to 8 p.m. beginning June 12. The cost is \$190 per person.

**Weight loss class** — This course is designed to help change the eating and thinking patterns of people who have trouble losing and maintaining weight loss. Learn about nutrition, exercise and behavioral patterns. This ten week course will meet on Tuesdays from 7 to 9 p.m. beginning May 28 with a cost of \$65 per person.

**Ladies weight training** — This popular course meets Mondays and Wednesdays from 7 to 8 p.m. for four weeks beginning June 10. The cost is \$20 per person and limited enrollment exists.

**Scuba** — The NAWI certified basic scuba course will meet Mondays from 6:30 to 9 p.m. with pool sessions on Wednesdays at 7 p.m. This six week course will begin on June 17 with a cost of \$45 per person. No equipment is necessary prior to the first meeting.

**Defensive driving** — Learn to drive safely and qualify for a ten percent reduction in your insurance for the next three years. Class will be held from 8 to 5 p.m. on June 22. The cost is \$20 per person.

**Beginning country western dance** — This course starts June 10 due to the fact that this will be the last session for the summer session. Class will meet for four weeks from 7:30 to 9:30 p.m.

**CPR** — Learn the basics of cardio-pulmonary resuscitation in two short days. A course everyone should have. Class will meet on June 18 and 19 from 7 to 10 p.m. Cost is \$10 per person.

## Japan joins Space Station Team

NASA Administrator James M. Beggs and Japanese Minister of State for Science and Technology, Reiichi Takeuchi, today signed in Tokyo a Memorandum of Understanding for the conduct of a cooperative program concerning detailed definition and preliminary design (Phase B) of a permanently manned Space Station.

Administrator Beggs said, "We applaud Japan's decision to join the greatest international cooperative space program in history. This is, indeed, a proud moment

for all who share our mutual dream to expand the peaceful uses of space for the benefit of all mankind. We look forward to working with our friends throughout the world to transform that dream into reality."

Under the memorandum, the United States and Japan will conduct and coordinate parallel Phase B studies. The agreement provides for interaction and information exchange during the next 2 years. Japan will study an experimental module that has

pressurized workspace and an exposed workdeck. The program is funded for \$5.7 million in Japanese Fiscal Year 1985, with the total Phase B funding estimated at \$22 million.

NASA signed an agreement April 16, with Canada and will sign with the European Space Agency in the near future.

Cooperation during the development, operations and utilization phases will require separate agreements.

## Lightweight SRB motor test fired

Morton Thiokol May 9 successfully test fired the second in a series of three firings of the lightweight Shuttle solid rocket booster at the company's horizontal test stand near Brigham City, Utah.

The two-minute firing was the second firing of development versions of the graphite/epoxy motor casings. A final firing of a flight version is planned for September.

Morton Thiokol in June will ship the first flight set of the filament-wound booster motor segments to Vandenberg AFB, California for stacking with an external tank and Orbiter *Discovery* for flight 62-A, the first Vandenberg launch, now planned for March 20, 1986.

## Music program benefits grads

A program of dances, music and songs of America and India will be presented May 18 at 7 p.m. in the Webster Intermediate School auditorium. Sponsored by the Krishen Foundation, admission is \$5 for adults, \$2 for children. Proceeds will go to outstanding area high school graduates.

## Cookin' in the Cafeteria

### Week of May 20 — 24, 1985

**Monday** — Cream of Celery Soup; Braised Beef Ribs, Chicken a la King, Enchiladas w/Chili, Italian Cutlet (Special); Navy Beans, Brussels Sprouts, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken; Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef & Barley Soup; Turkey & Dressing, Country Style Steak, Stuffed Cabbage (Special); Corn Cobbette, Okra & Tomatoes, French Beans.

**Wednesday** — Seafood Gumbo; Catfish w/Hush Puppies, Roast Pork w/Dressing, Pepper Steak (Special); Broccoli, Macaroni & Cheese, Stewed Tomatoes.

**Thursday** — Cream of Tomato Soup; Beef Tacos, BBQ Ham Slice, Hungarian Goulash, Chicken Fried Steak (Special); Spinach, Pinto Beans, Beets.

**Friday** — Seafood Gumbo; Liver & Onions, Deviled Crabs, Roast Beef w/Dressing, Tuna & Noodle Casserole (Special); Whipped Potatoes, Peas, Cauliflower.

### Week of May 27 — 31, 1985

**Monday** — Memorial Day Holiday.

**Tuesday** — Split Pea Soup; Salisbury Steak, Shrimp Creole, Fried Chicken (Special); Mixed Vegetables, Beets, Whipped Potatoes.

**Wednesday** — Seafood Gumbo; Fried Catfish w/Hush Puppies, Braised Beef Rib, BBQ Plate, Wieners & Beans, Shrimp Salad, Stuffed Bell Pepper (Special); Corn O'Brian, Rice, Italian Green Beans.

**Thursday** — Chicken Noodle Soup; Beef Stroganoff, Turkey & Dressing, BBQ Smoked Link (Special); Lima Beans, Buttered Squash, Spanish Rice.

**Friday** — Seafood Gumbo; Broiled Turbot, Liver & Onions, Fried Shrimp, Meat Sauce & Spaghetti (Special) Green Beans, Buttered Broccoli, Whipped Potatoes.

### \*AT BUILDING 3

On Wednesday we feature The Reuben: Corned Brisket, Swiss Cheese on a bed of Saurkraut, Pupun Mustard on Rye and ¼ Pickle. Delicious! Monday and Thursday check out our French Dip Sandwich.

## Arabsat names payload specialist

An Arabsat payload specialist who will fly on the 51-G Space Shuttle mission in June will conduct 70mm photography over Saudi Arabia, 35mm photography of a fluids experiment, and will participate in the French Posture Experiment.

The payload specialist, Sultan Salman Abdelazize Al-Saud, is flying as part of the reimbursable agreement with the Arab Satellite Communications Organization covering the launch of the Arabsat 1B communications satellite.

The seven-day STS mission is

scheduled for launch no earlier than June 12, 1985.

The 70mm camera will be used to take pictures on daylight orbital passes over Saudi Arabia.

The 35mm camera will be used to document such phenomena as surface tension effects on mixed fluids in the absence of gravity.

Television will be used to document firings of the orbiter's orbital maneuvering system and reaction control system engines in an ionized gas experiment.

Other activities include photography of the new moon in a lunar

crescent observation and assisting the French payload specialist as a test subject in the French Posture experiment.

Crew of the 51-G mission is: Daniel C. Brandenstein, commander; John O. Creighton, pilot; Shan on W. Lucid, John M. Fabian and Steven R. Nagel, mission specialists; Patrick Baudry, French payload specialist; and Sultan Salman Abdelazize Al-Saud, Arabsat payload specialist. Backup payload specialist for Arabsat is Abdulmohsen Hamad Al-Bassam.

## NASA picks SLS specialists

NASA has announced the selection of two payload specialists for the initial Spacelab Life Sciences (SLS-1) flight, and one of two payload specialists for the second flight, SLS-2.

The payload specialists for SLS-1 are Dr. Francis A. Gaffney, 37, an assistant professor of medicine and cardiology and director of echocardiography at the University of Texas Health Science Center, Southwestern Medical School, Dallas; and Dr. Robert W. Ward, 56, a veterinarian and professor of physiology and nutrition at Colorado State University, Ft. Collins.

The payload specialist for SLS-2 is Dr. Millie Hughes-Fulford, 39, an assistant professor of biochemistry at the Veterans Administration Hospital in San Francisco. Hughes-Fulford is the first woman to be selected by NASA as a prime payload specialist for a Space Shuttle flight.

The selections were made by NASA Administrator James M. Beggs on the recommendation of Dr. Burton I. Edelson, Associate

Administrator for Space Science and Applications, and the Investigators Working Group, comprised of principal investigators for the flights.

"These two flights are the first fully dedicated life sciences missions to be flown aboard the Space Shuttle," Edelson said. "This is a significant effort in improving our knowledge of living beings in the space environment and it will be a major step in preparing men and women for life aboard the Space Station scheduled for launch in the early 1990s," he added.

A fourth payload specialist candidate, for the SLS-2 mission, will be selected shortly and will begin training with the three announced specialists in the near future.

Criteria for the selection included an advanced degree in life sciences or a medical degree and significant recent experience in laboratory research.

Nearly 50 candidates were nominated by the two flight's 23 principal investigators. The candi-

dates underwent rigorous investigation by the group's Payload Specialist Selection Committee in late 1983. The final recommendations were made to NASA Headquarters in mid-April 1985.

SLS-1 is to be ready for launch aboard the Space Shuttle as early as spring 1986. SLS-2 is scheduled for an early 1987 launch.

The STS 61-D/SLS-1 mission will be commanded by veteran astronaut Vance Brand. Pilots will be David Griggs and Dr. John Fabian. The mission specialists will be Drs. Rhea Seddon and James Bagian.

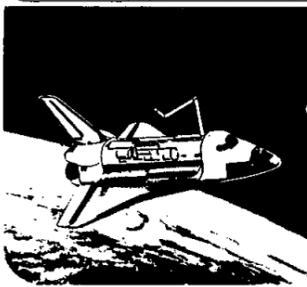
The flight crew for the STS 71-G/SLS-2 mission is yet to be selected.

The two flights will conduct a variety of experiments in human and animal physiology and gravitational biology. Thirty major life sciences experiments will be conducted on the two flights.

The SLS-1 and SLS-2 missions are managed by Johnson Space Center, Houston, for NASA's Office of Science and Applications, Washington, D.C.

NASA  
Lyndon B. Johnson Space Center

## Space News Roundup

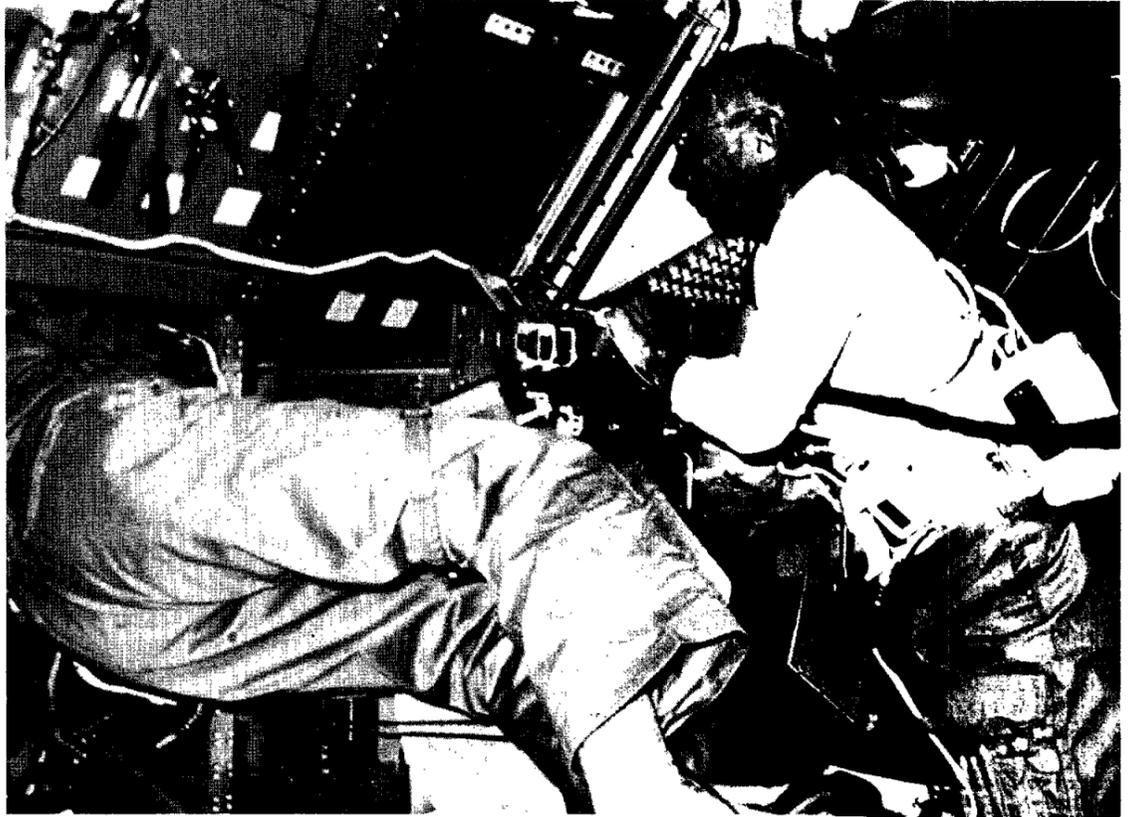
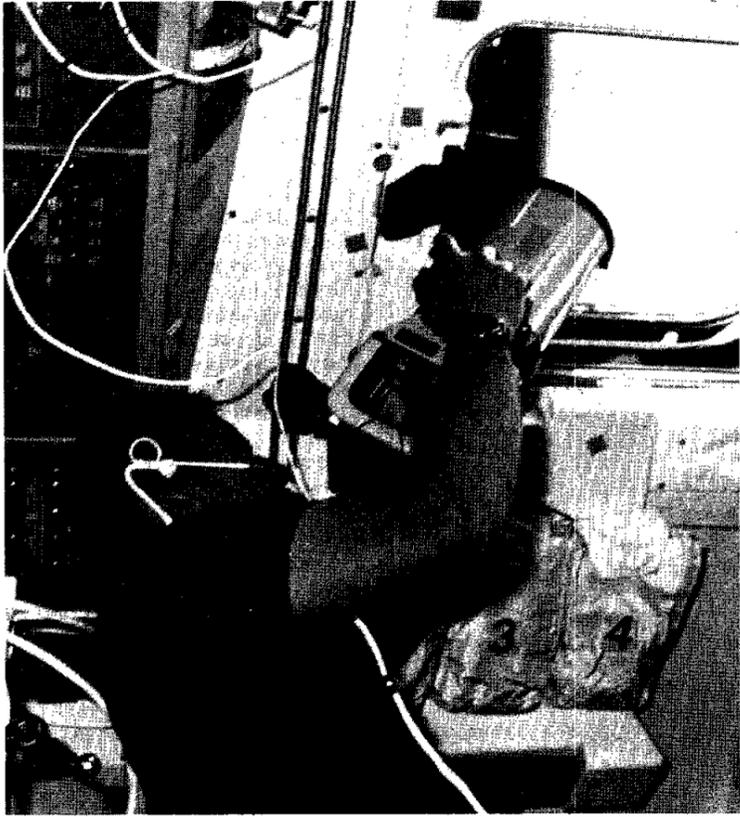


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Editor ..... Brian Welch

Editorial Assistant ..... Tina Griego

# A vicarious look at the 51-B crew at work



51-B commander Bob Overmyer takes aim at an earth feature with a 4x5 Linhof aerial camera through a flight deck overhead window.

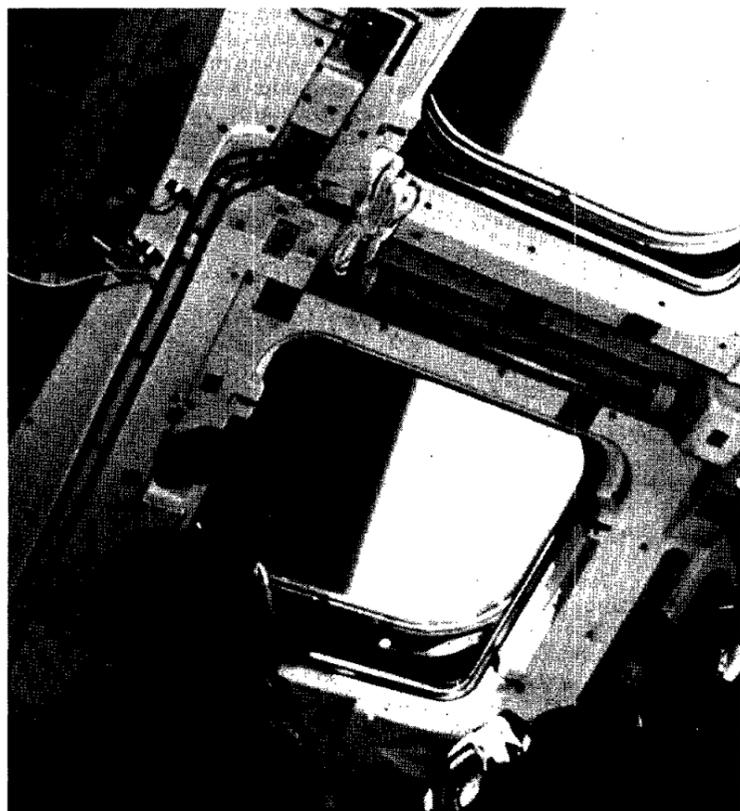
Bill Thornton lends Taylor Wang a helping hand in repairing the drop dynamics module to get the experiment operational. Inflight maintenance procedures were teleprinted to the crew, including circuitry diagrams and other technical details of Wang's experiment.



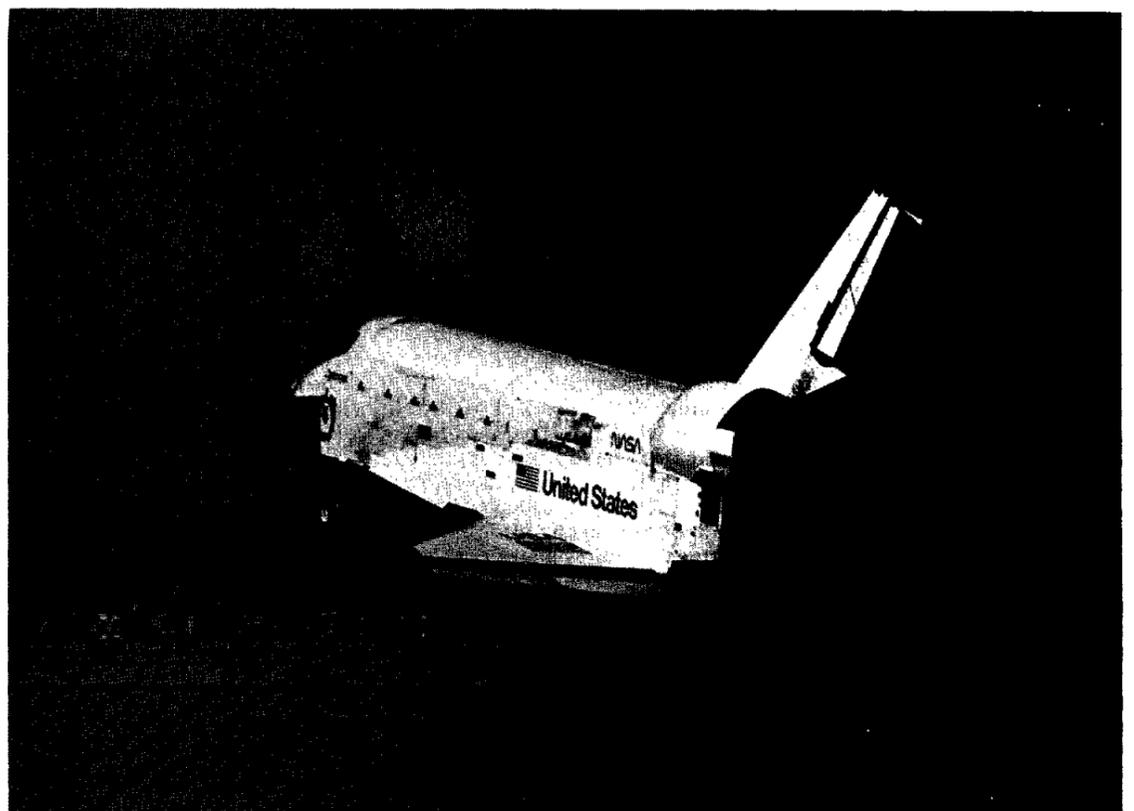
Norm Thagard prepares for sleep in *Challenger's* bunkhouse while Don Lind is wired up for the autogenic feedback training experiment. The flight crew worked dual 12-on, 12-off shifts during the seven-day mission.



Doctor Bill provides human reassurance to one of his primate friends in Spacelab's research animal holding facility which was evaluated for future flights during 51-B.



Lodewijk van den Berg watches his home planet spin by a flight deck overhead window. The earth horizon and airglow are visible in this photo.



Bob Overmyer "greases" *Challenger* onto Edwards AFB Runway 17 centerline after an approach that brought the spacecraft over Long Beach, Los Angeles and downtown Burbank, setting off burglar alarms with its sonic boom.

## Interview

## \* Dr. Glynn S. Lunney

Dr. Glynn S. Lunney, Manager of the National Space Transportation Systems Program, will be leaving the Agency soon. He began his government service as a co-op, working at the Lewis Research Center, and from there he became a part of the Space Task Group and ultimately recorded a career that almost exactly spans the period of U.S. efforts in space. What follows is an interview conducted with Lunney a few days after the conclusion of the STS 51-D mission.

**Roundup:** How did you get started in this business?

**Lunney:** When I went to college I wanted to become an aeronautical engineer and I also was in a co-op program. That program put us at work six months out of every year in three month segments. The place that worked out for me to go was the Lewis Research Center in Cleveland, then an NACA center. As far as I was concerned, Lewis was the place. So I spent the next couple of years going to school in Detroit and then cycling through different places at Lewis doing different kinds of odd jobs and learning things and I got a big kick out of it.

**Roundup:** Can you think of anything before you got into school that made you say to yourself, "Yeah I want to be an aeroengineer."

**Lunney:** Oh, I was always interested in airplanes and flying.

**Roundup:** Model rockets?

**Lunney:** Yeah, well not so much rockets, but mostly airplanes and building models and things like that and I was always kind of intrigued with it. I never did really do any flying myself because it's expensive. It was just sort of what I always wanted to do.

**Roundup:** So you got to Lewis. What did you do?

**Lunney:** Let's see, I did different things. My first job was with a group of people who were working on jet engines and they were working on devices to control the back pressure on an engine in a variable way. They'd do little plug nozzles that they would translate back and forth and change the areas, the exit area of the nozzle. It was a test oriented place where people ran tests in chambers, on engine test stands, took data of one kind or another and measured it and was almost typical NACA in that it didn't even necessarily have to be targeted at a specific airplane application, but rather general knowledge of different parts of engines and how to control them in different ways and what you could do to improve their performance and so on. In this particular case I was working with some guys who were working on this cooling of a plug nozzle that was used to change the exit area and the back pressure on the engines. Later I worked in wind tunnels.

**Roundup:** What kind?

**Lunney:** I worked in a 10 x 10 supersonic wind tunnel which was a premier wind tunnel at that time in the '50s. A ten by ten foot test section, Mach 3 wind tunnel. We only ran it at night because it was the only time Cleveland whatever it was called electric company could supply enough power to run it.

**Roundup:** Did the tunnel use small scale models?

**Lunney:** Oh no, we had big models. This was a tunnel with a big ten by ten foot cross section in the test area. We worked on just engine test data and correlating engine test data and finding ways to map performance on engines so that there would be more generic, general data and more generically comparable to other engines. And I worked in test stands and in



report writing, and I worked in a place where we were daddling with a shock tube but we never really got very far.

**Roundup:** What's a shock tube?

**Lunney:** Where you release a large amount of gas at high pressure quickly then you kinda send a shock wave down a tube. And it was a way to get certain kinds of tests done although it's not a steady state wind tunnel where you keep the air flowing but rather a one shot thing where you fire the shock down the tube and it passes over your model and you take a picture at the right time and maybe you'll learn something. And then when I got out of college I went back to Lewis and worked in a group that was doing a blunt body re-entry heating analysis as in the blunt body concepts that people had developed for re-entering bodies. It was just at the point where people realized that all airplanes were getting sharper and sharper as they tried to get through the air and decrease the drag, but that when we got to orbital re-entry speeds the conclusion was we had to go to blunt bodies. It was a complete change of face, supported by a lot of analytical and conceptual work at the time by people around the country in NACA including out at Ames, as I recall, Eggers and Allen. We were involved in that and then in building models which were flown underneath a B-57 and air-dropped out of Wallops. The Langley people were there too, doing ground launch models.

**Roundup:** And that was Robert Gilruth's division, the Pilotless Aircraft Research Division?

**Lunney:** Well, I'm not sure who all owned what but it was Gilruth's outfit that was doing that kind of work. He was certainly associated with it. We were doing a similar kind of research, although we skipped the first stage and were airdropping them because we had this B-57. So it was a very comparable set of work that was going on, you know complimentary in that we would be examining one kind of shape and set of conditions and the Langley guys would be making some other tests on other shapes and other entry conditions. The Mercury Project began out of that kind of thinking and the men involved in doing the work became associated with blunt body re-entry work. In the summer of '58, which

was the year I graduated from college, I saw the first sketch of a man in a blunt-body capsule. As a matter of fact, the sketch was done by Caldwell Johnson whom I then really met much later in a close way in ASTP on the docking mechanism work. But anyway, the Langley guys were really the initiators of this manned capsule work. Because we had a close association in terms of the same kind of work, they began to draw us into the things they were doing down there. So we went on down to Langley and we actually did a number of things with what became the Space Task Group guys while we worked at Lewis. We would decide what problems we would work on and we just gradually became more and more involved and by September of '59, like a year later, after spending some of that time traveling down there every week, a number of us actually moved to Langley Field.

**Roundup:** And eventually you ended up as one of the original 35 members of the Space Task Group. Today that is a mark of distinction in many ways. How did you do it? How does a kid just out of school end up in this select group? Did you have to go out and pursue it?

**Lunney:** Well no. Hell, it was all just dumb luck. I mean it was being in the right place at the right time. As soon as I had an inkling of what it was people were working on, I was very excited about it and I probably worked hard and displayed a lot of enthusiasm, which helps because attitude is all, almost. But it was just plain luck on my part to be in the right place at the right time with the right group of people when all this was just happening. So for me it was not a matter of choice in the sense of being really aware of what this sort of a thing could lead to, where it might move to or that it might fail also, by the way, which a lot of people thought at the time.

**Roundup:** Could it have been the deadend of your career?

**Lunney:** Sure, but that thought never even entered my mind. I don't ever recall giving that 30 seconds of thought. I'm sure that the fellows who had been around for ten years were much more mature in their understanding of what was transpiring and how it could end up being pretty good or pretty bad in terms of whether it

would succeed or not. But only the success part of the ledger was open in my mind and I just dismissed any concept of failure.

**Roundup:** The NACA tended to engender that in people wouldn't you say?

**Lunney:** I suppose, I don't know. The NACA was a nice place to work. It was a different place to work than the kind of thing we do in the manned program today. But it was a good place to work, with solid people and a sort of a peer pressure to excel existed much as it does at this center and other centers. It was a low-budget place compared to what we do today and it was a kind of low key place. People hardly knew it existed, the public hardly knew it existed. But it had served the nation very, very well, I believe over the years and that contribution was probably what led Eisenhower to decide that Mercury was actually going to be done within NACA. So it was the contribution of all those people that caused NACA to have such a good reputation that when the thought of creating a space agency came along it was just a natural thing to build upon that team of professional people. It was another one of those accidents of history I suppose, but it wasn't an accident

Bob Piland and Chuck Matthews. They were the ops guys, they were making things happen. Then they hired a lot of people from the outside and that was interesting in itself because it was curious that they didn't draw more from NACA at the time, although I remember there was a certain class struggle in that. I believe there were a lot of people who thought this thing was a fly-by-night affair that was going to go down the tubes. And then the other thing that happened, later on, was when we really needed a slug of more experienced and sound people, the group from Canada came in.

**Roundup:** The group from Canada?

**Lunney:** Oh yeah, the Avro group. When the Avro Arrow was cancelled, the United States acquired the services of several dozen players, people like Jim Chamberlain, John Hodge, you know the whole raft of people who came in from Canada, somewhere right around 1960. When the Arrow was terminated, these guys who had struggled to build what was in their eyes a beautiful machine were crushed. But America lucked out. Again, it was another accident of timing. The people from Canada came in and contributed a great deal in terms of the seasoning of the group, if you will. They had all of us young guys and hell, we were sorta brash young men, and we needed some people who could steer us a little bit. So the Space Task Group ended up having this strong leadership, the brash young soldiers, if you want to think of us as that, and then this wave of solid engineering people with maturity and some experience to balance the whole thing. And we put all that together and it just rolled. It was really rolling. Later, of course, we got involved with the people who were building rockets at the time in the U.S., we got involved with the Redstone gang. Then we got involved with the Atlas people.

**Roundup:** Who were they?

**Lunney:** They were mostly out on the West Coast. We dealt with the Air Force BMD, Ballistic Missile Division, General Dynamics, and Walt Williams somewhere in there joined the team. He was brought back, I guess, from Edwards and joined the Space Task Group at some point around then. He added a tremendous amount of seasoned operational leadership to this emerging, confident—but not always sure of what exactly we were going to go do—group of people.

**Roundup:** And in the meantime, you've got Vanguard missiles blowing up on the pad and seeming-

*"The first one we tried, the bloody thing settled back on the pad. I was in the blockhouse thinking, 'My God, this is really something, look at that.' It was all kind of spooky."*

that NACA was peopled with very outstanding talents. That was no accident.

**Roundup:** Does that whole time seem amazing to you now?

**Lunney:** It does seem amazing. You know so many young people were hired in, and that was when people like Gene Kranz showed up, Arnie Aldrich, Bob Ernull, and a whole raft of young people showed up and it was an interesting match. We had several senior people like Dr. Gilruth, people who had been around the flight business awhile. Then we had kind of the leadership supplied by people like

ly, to the public anyway, one failure after another.

**Lunney:** Yeah, well we didn't have anything to do with that, but it was very distressing. I spent the first years of my rocket career looking at failures. As a matter of fact, you see movies occasionally, like the movie "Space," where they replay many of the early failures. I saw a lot of those films at the time and they were frightening in the sense of really driving home what was at risk here and how hard it was to make the bloody things work right. So we always had this realization

(Continued on page 5)

*"Apollo 13 . . . was almost as if a final exam was presented to the class with almost no margin for error. After ten years of struggling with all kinds of problems in flight, the maximum test was put to the team."*

(Continued from page 4)

that we were riding on things that were inherently dangerous. When I say we were riding on them, I mean that we sort of felt that way, we all were in that together. Of course, the first astronauts were the guys that were going to ride on them. Then we just got started with the Redstone gang. We got to the early flights of Mercury, with the unmanned Mercury Redstone. The first one we tried, the bloody thing settled back on the pad. The spacecraft thought it had gone through the whole launch sequence because of the way the thing happened. It thought it lit, it thought the rocket burned and it thought that it shut down by the way the signals passed because the rocket ignited and then shut down before it ever lifted off. In the meantime, the Mercury capsule thought it was landing in the water so it started its own sequence and it also decided, by the way, that it was down below 10,000 feet and so the parachutes popped out. So the parachutes started coming out on the pad and I was in the blockhouse thinking to myself, 'My God, this is really something, look at that.' It was all kind of spooky.

**Roundup:** Was that a low point?  
**Lunney:** Well, I don't ever remember being exactly low. I always remember a feeling of charging along. Whatever came up we would just fix it and get on with it. That was the mood. Depression would set in occasionally in terms of the Russian achievements as they would do things. We had this sense of being behind the power curve a little bit, but we were still confident. Later on we get to talk to the men who did that in the Soviet Union and they were busting too to get that stuff done and they were barely hanging on by their fingernails to do what they did. They, probably more in a more calculated way than we, tried to do things that would have a political impact. We had our program laid out in a way that was technically and programmatically sound and stuck to it. It also had a political impact, by the way, but it was almost as if they did some things that were calculated, that they didn't really need to do or probably in the normal course would not have done. So that pervaded the early couple of years of the Mercury program, while we were struggling with the little Redstone things, they went into orbit and so it was quite a time. We had unmanned Mercury capsule launch vehicle failures, MA-3 came apart, and on MA-2 the booster engines didn't fall off so we dragged the dead weight of those engines all the way to cutoff conditions and the whole trajectory just kind of sagged down. And on top of all these engineering unknowns there were always other people running around with various review committees asking if the United States should really take this risk. And there was a group of people who would answer no to that question. The United States should not take this risk because we stand to lose our prestige and dignity and an astronaut, they would say. So there was a school of thought like that. Then there was a school of thought from the doctors who were hysterical, some of whom felt that people were going to flip out when they went into zero gravity and so on. And it seems funny now but at the time there was a whole group of people who seriously thought that and were seriously working to cause the program to either change or cancel because they were so concerned. So it was a little bit like "the LEM is going to sink into the

moon" business that came during Apollo. Of course all of us just ignored all that, didn't pay the slightest bit of attention to it. I really don't know who in the Space Task Group or in NASA dealt with that at the time but they sure did a hell of a job. I expect George Low, who was in Washington at the time, did a fair bit of that and Dr. Gilruth also, but that was all outside of my scope and I never really paid any attention to all that stuff. We just kept rattling on with what we were going to do. We started building the control center. The idea was, 'Well, let's build a control center,' so we built one in, I don't know, hell, we must have built it in a year or something at the Cape because it was working for the launches in 1961. We had the control center at the Cape in no time.

**Roundup:** Were you proud of it afterwards?

**Lunney:** Oh yeah, we loved it. I mean it was our home, it was a wonderful place. I haven't been in the building in a while, but it was a wonderful place because that was where we did all of our initial thinking and struggling and had our setbacks and triumphs. We used it through the first few flights of Gemini until we got the MCC in place. But the little old Mercury control center at the Cape, oh, we loved that place. We loved it.

**Roundup:** In "The Right Stuff", was the set realistic?

was quite a time, it was very heady and very exciting and we just had at it. All these young guys that had been hired in were all sent to these stations as chiefs, and here we were in our early twenties. The CapComs at these stations were either astronauts or one of our young men. We didn't have air-to-ground coming in from the remote sites to the control center either, by the way. The CapCom at the site would talk to the spacecraft, and then they would send a teletype back telling us what happened. I mean it was really pretty flaky compared to today.

**Roundup:** How did you transfer the data?

**Lunney:** Teletype.

**Roundup:** Teletype?

**Lunney:** Yeah, you would sit around and type the stuff on teletype and send it back.

**Roundup:** Amazing.

**Lunney:** Yes it was. It was quite a deal.

**Roundup:** Do you think if you took a similar group of engineers and put them in a room under the same circumstances they would come up with the same type of science, if you will, of flight control? Did you stumble onto something there?

**Lunney:** I think it would depend upon having at least enough senior leadership to make them realize what sort of discipline and order had to be brought to it. A group of young people all by themselves

today in the program that are sobering. I mean go look at the tires from the last flight, for example. That's got to be sobering. It is an example of the fact that we push our people and our equipment pretty hard and sometimes we don't always know exactly how much margin we have in these things. We try to know but in some cases it's very difficult because there are so many parameters that enter into it, like the landing situation.

**Roundup:** What was your high point during Apollo?

**Lunney:** Apollo? Several of course. I think Apollo 8 was much more of a high point for the non-astronauts in the program. I think 11 was the high point for the astronaut team, if you ask them. For the engineers, the turning point for Apollo was the Apollo 8 flight. You have to realize, that on the second flight of the command service module and the third flight of the Saturn V, we took it to the moon. And you know, you said NASA makes conservative decisions, but that was a bold choice, a courageous choice, one that probably enabled the landing in 1969. Going from Earth orbit to the Moon was a hell of a step, but lo and behold we got there and went around in a lunar orbit and did some things and finally got out of there, holding our breath. So from that point on we were going for it. That was one of the things that came out of Gemini. What came out of the Gemini program was not necessarily the hardware, but the lineal descendants of the group that did the Mercury work. They had an opportunity to test themselves and become confident in their skills in doing things like rendezvous, EVA, big burns, docking, tethers, flying around on things, you name it. What came out of that was a gangbuster group of people in the astronaut office, in the ground crews, in the control center ground team, who experimented in



**Lunney:** I don't know. There's a lot of that film that's not entirely realistic. But the control center was a neat place. We liked it. We designed it, put it together, made up all these plots and charts and decided what we were going to look at. We made up all these mission rules. We simulated. We had this network of stations all around the world that we'd mail these teams of people to. Maybe five or six people would travel to a remote site and they would come back with the most outrageous stories and happenings. We'd send them on ships and the whole thing was like, it's hard to find an analogy for it, but it was like a big adventure.

**Roundup:** How can an engineer possibly have a better time?

**Lunney:** That's what I said. At one point in all this I said to myself, "My God, why would anybody ever do anything other than this for a living?" I was traveling for awhile to the Bermuda station, which was the first station that could pick up on the spacecraft in orbit. We considered lot of issues then, like how do we know it's in orbit, what do we do if it isn't, what do we do if it is and talked about a lot of procedures along those lines. Although it is different today it all comes from the same set of thinking. It's like a set of values or a code of ethics that is passed down and changes a little bit and the vocabulary is a little different but it's the same root set of ethics that we developed in those early days. It

might fumble around and get tired. But people like Walt Williams and Chris Kraft brought a sense of discipline and order to what we were doing. They provided guideposts, the backbone, and we just filled it in. Both NASA and the country were extremely fortunate in that they had the caliber of people coming out of the NACA who could just step right up to this thing with confidence in their own abilities. It is a remarkable testimony, I think, to the people. I'm not sure it really has been fully appreciated what an achievement and what a contribution that was made by a handful of men at the time. There were probably a dozen key players in the senior leadership of the Space Task Group and in Washington. They were the right people at the right time. I was an implementer, but they were people who dealt with the political system and the big technical issues and choices. Their judgement just carried the thing.

**Roundup:** Would a historian be off base tracing NASA's conservative approach to flight control back to the days when rockets were falling off the pad and future program officials were seeing these things blow up? Dr. Kraft once said that people who don't realize the inherent danger of launches and spaceflight just don't understand the business. **Lunney:** Well that's true. I haven't thought about it much in that way but perhaps. It's a sobering kind of thing. Things still happen

the Gemini with all the things that could possibly be done with the hardware, that would apply to what had to be done when we went to the Moon. And those people just assaulted the Apollo program. I mean that group of people just attacked the Moon landing thing. They were honed, tested, seasoned, confident even bold. I'm differentiating now from the design of the ship which was also a big job and perhaps even a bigger job conducted by other people. I'm speaking to the operational people that came out of Gemini and then found this hardware that other people designed and got built for the ops team to use. That ops team was just a gangbusters group of people, and that team just went zipping through the Apollo program. The other thing about Apollo, of course, was Apollo 13. It was the maximum test of getting a crew in a spacecraft back, a maximum test in that it could not have been much worse without us losing it. It was almost as if, after all the years of ground and flight crew coordination and team work it was almost as if a final exam was presented to the class with almost no margin for error. Any error and we probably would have lost the thing. After ten years of struggling with all kinds of problems in flight, the maximum test was put to the team. And boy I'll tell you, they were just terrific. I think about it and it warms my heart, the team was just so god-damn good.

**Roundup:** What images come to you when you think of that time?

**Lunney:** I just think about getting it done. I remember the people. I just remember the people and the work and the crispness of it and the singlemindedness of it and the not shirking from it, and the feeling that the peer pressure that I talked about creates. I remember the men who were the flight directors that I worked with, Gerry Griffin and Gene Kranz and the things that we did. I remember the management, up to and including the administrator of NASA, Tom Paine. I remember sitting down with him and George Low, who was Deputy Administrator at the time. We would brief them every shift or so. We'd say look, this is going on, we've got this problem, we've got these options, we're thinking of doing this, we've got some guys working on that, just like it goes on today. I mean all the things that go on in the control center like went on during the Syncom problem. But we'd go down and brief the management, and their only question of us was, 'What can we do to help?' That was the only thing they ever asked us. I mean, no sense of meddling, no sense of a lack of confidence by the management in the teams that were doing the work, a sense of complete support. That didn't really sink in on me until after the fact, how well they reacted in terms of no panic and all support. They were really good. It reflected a confidence, I think, in our teams and the crews. And that's what goes on today. The Syncom repair we just tried. The same code of ethics applies, the same set of values is at work. The same peer pressure is there to excel. All the same things are going on 25 years later. It's a wonderful thing to watch it go on. Perhaps people who aren't used to watching that don't quite see it the way I do because it's an alive thing, this process. It's very alive. You can trace the ancestry of it.

**Roundup:** Let's shift gears for a minute. I'd like to get your reaction to some of the views that seem to form about the space program, the Shuttle in particular. One is the view that we could be doing so much more today in the American space program if we just wouldn't try to send people into space. We're missing out on the planetary program, critics say. The shuttle is draining funds from other efforts. How do you react to that?

**Lunney:** Well, in the first place, the budget facts would show that, at the largest level, the budget for other space activities in NASA succeeds as the manned space program succeeds. It is not necessarily a fact that if we weren't spending money on the manned program that we would spend it on these other things. The odds are we wouldn't. The odds are the United States Government would spend it in some other place. The manned part of the program has been and will be the core of what we will be doing in space. If you could put yourself out a hundred years from today you would see a lot of unmanned things going on. We'll have robotics and so on and so on. But anybody who could imagine themselves out a hundred years from today cannot possibly have anything in his head except also a very large presence of people. You just can't sit there and talk about the probes of a hundred years from now and not realize that you don't get there unless you do what we are doing today. So that is all, in my opinion, a false and somewhat self-serving and probably naive statement that people are fond of making.

**Roundup:** Here's another statement often heard: The Shuttle has yet to prove itself, is a drain on the taxpayers of this country and probably will always have to be subsidized.

**Lunney:** The Shuttle, in my opinion, is a remarkable achievement. It was estimated in 1970 what it would cost to develop the system, and within almost no difference from that number, maybe five percent, the team of people built the Shuttle and flew it.

# Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

## Property & Rentals

For sale: Friendswood, four acre estate, 4 BR brick home, double carport, separate one BR guest house, horse barn and pasture, large swimming pool, two water wells, several garages and storage buildings, \$225K. Call Stafford, x6337 or 482-7158.

For rent: Seabrook, 4-2 fully or partly furnished, housekeeping and lawn services included, summer 1985 to summer 1986, \$850/mo. Call 474-5650 or 474-3319.

For sale or lease: Nassau Bay, 4-2-2 master down, new carpet, paint, roof, sun deck, large garage and kitchen, 20 ft. FPL, atrium, purchased for \$127,500, sell for \$114,900. Call Jerry, x3561.

For lease: El Dorado Trace, 2-2, split BR, W/D, FPL, ceiling fan, appliances, smoke/security alarms, pool and rec. key. Call Rose, x1341 or 488-6046.

For lease: Forest Bend townhouse, 2-1.5, ceiling fans, patio, \$395/mo. Call Craig, x4031 or 420-2936.

For rent: Galveston Gulf Front Condo, treat yourself to a two day to one month vacation, completely furnished, low rates. Call Nussman, 488-7762.

For sale: Pagosa, Colo, mobile home lot, utilities available, San Juan Mts., hunting, fishing, winter sports, area industries. Call Nitschke, 481-4773.

For rent: South Padre Island, 2-2 condo, on the beach, sleeps six, week of June 29 to July 6 plus deposit, \$650. Call Sylvia, 326-2814.

For sale: Middlebrook II, 4-2-2A, contemporary design, open floor plan, vaulted ceiling in living area, well maintained, \$92,900. Call 488-7387.

For sale: Burnet county, 37.5 and ten acre tracts, excellent hunting, great location, \$2,000/acre and up. Call 1-915-388-3786.

For sale, lease or trade: Townhome and duplex, both in excellent condition, all appliances, walking distance to A&M, low equities, assume loans, available in May. Call 996-9600.

For sale or lease: Next to NASA, two BR condo, appliances, cable, W/D connect., fenced patio w/storage, deposit, references, \$385/mo. less move discount. Call Cecil Gibson, x3918 or 488-0719.

For lease: Clearlake, 3-2 rambler, fenced yard, FPL, two car garage, five minutes to JSC, assume 9.5% VA loan, \$72,900. Call Rodney 301-428-2638.

For sale or lease: Lakeshore condo, 2-2-2, W/D, refrig, two storage areas, pier, pool, clubhouse, split bedroom plan, \$495/mo. plus deposit, \$57,700. Call Bob, 280-3655 or after 6 p.m. 484-3318.

For sale: Friendswood, 1.8 acres, some financing available. Call Jack, 482-6888 or Janice, x5867.

Lifetime vacation condo on Lake Conroe with exchange privileges to international condos. Call Don, 280-6307 or 554-6205.

For sale: League City, 3-2-2 plus carport, quiet wooded area with water access, many updated items, \$55,000. Call 538-4214 after 5 p.m.

For sale: League City/Newport, 3-2-2, FPL, cathedral ceiling, formats, indoor utility, beautiful, \$69,900. Call 332-2291.

For rent: Galveston/Tiki island, 3 BR home on canal, new, furnished, dock your boat, fish, swim, TV, master bath spa, weekend, weekly & monthly rates. Call 486-9335.

For sale: Point Lookout, west on Lake Livingston, beautiful wooded waterfront lot, 75 x 137, \$3,500, (assessed tax value \$5,800). Call 946-7587.

For sale: La Porte, 2-1.5 townhouse, double covered carport, fenced yard, storage shed, spacious grounds, swimming pool and tennis, owner transferred, \$39,900 OBO. Call 471-3425.

For sale or lease: 610 loop and I-10 east area, 1982 mobile home, 2-1, 14 x 64, 2.5 ton AC, Appls and W/D connections, looking to relocate, park has big trees, swimming pool and pays water bills, \$286/mo. with no down payment. Call 455-2146.

For sale: Dickinson, 2-1, 1983 mobile home, 14 x 64 in adult section of park with pool, lots of extras, energy efficient, \$750 and assume \$297/mo. Call Garner, x5857 or 534-3499 evenings.

For sale: University Green, 2-2-2, Village Builders patio home, corner lot, adjacent greenbelt, cathedral ceilings, FPL, Jen-air range, neutral colors, near tennis courts and pool, owner financing, \$94,500. Call 480-7413.

For sale: Two BR mobile home, new carpet and tile, perfect starter home or vacation cabin, appraised at \$9,700, first \$7,500 accepted. Call 332-2291.

For sale or lease: Egret Bay, 2-2-2, W/D, microwave, refrigerator, fans, FPL, pool, boat ramp, 24 hr. security, \$450/mo. Call Lee, x3431 or 333-9447 after 5 p.m.

For lease: Heritage Park, 3-2-2, formal dining, living, FPL, fence, large kitchen, \$575/mo. Call 482-6609.

For rent: Two BR condo in Hawaii, Las Vegas, Acapulco, Spain, others, sleeps 6-8, \$450 per week. Call Janice, x5867 or 482-6888.

For sale: Waterfront lot on 244 acre lake with access to fishing, tennis, swimming and horseback riding. Call Don, 280-6307 or 554-6205.

For sale: Wedgewood/Friendswood, 3-2-2, over 2,000 sq. ft., large recreation room, fresh paint, new carpet, all electric, assumable 7.75% VA loan, \$70,500. Call Jeff, x4237.

For rent: Galveston bay, two BR, enjoy over 75 ft. of deck and patio, central air/heat, prefer mature individual. Call Marilyn Paul, 280-7732 or 559-2030.

## Cars & Trucks

1979 Plymouth Champ, AM/FM stereo, sunroof, Stewart & Warner gauges, digital clock, economical, \$1,995. Call Jeff, x3967 or x996-0755 after 5 p.m.

1977 Ford LTD Landau, two dr., PS, PB, auto, split bench seats, fabric interior, loaded, \$1,750. Call Barbara, x2328 or 482-1106 evenings.

1978 Oldsmobile Royale, four dr., auto., PS, PB, AM/FM/cassette, \$2,000. Call Clyde, x2482.

1980 Ford Fairmont, four cyl., A/T, AC, AM/FM/cassette, no rust, no dents, excellent condition, \$3,200. Call 532-1793 after 5 p.m.

1978 Datsun B210, excellent condition, 99K miles. Call 649-1493.

1979 Ford LTD station wagon, PS, PB, auto., AM/FM, 65K miles, excellent condition, \$2,200. Call Dave, 480-4031.

1977 Chevrolet Nova Concours edition, excellent condition, inside, outside, mechanically, has been well taken care of, \$3,000. Call 554-4133 after 5 p.m.

1975 BMW 530i, excellent condition, like new, \$4,000. Call 488-1862.

1983 Cavalier, four dr., 21K miles, white walls, AM radio, no air, excellent condition, \$4,750. Call 532-1117 after 5 p.m.

1982 Camaro, V6, std., AC, AM/FM stereo, PB, PS, tilt steering, nice interior, \$3,700K, \$6,700. Call 554-4263 after 5 p.m.

1977 Mercedes Benz, gold metallic coupe, A/C, auto., sunroof, burlwood, immaculate condition, best offer. Call Marilyn Paul, 280-7732 or 559-2030.

1971 Buick LeSabre, very good condition, 46K miles only \$880. Call 480-3565.

1977 Chevy Monte Carlo Landau, brown/beige, AM/FM/cassette, PS, PB, AC, good condition, \$2,000 OBO. Call Kimberly, 488-9005 x270 or 480-0244 after 5 p.m.

1971 Volvo, four dr., auto., 66K miles, weathered paint but good body, good tires, \$1,000 OBO. Call Tandri, x2381 or 474-4506.

1976 Datsun B-210, four spd., runs well, economical, \$500. Call Linda, 538-3665 evenings.

1981 X-11 Citation, bright red, 28K miles, exceptionally clean, one owner, \$4,000. Call J. C. Waite, x4241 or 332-2983 evenings.

1964 Chevy pickup, LWB, rebuilt engine and transmission, new brakes, clutch, starter, etc. \$1,295. Call 326-4613 after 6 p.m.

1980 Pontiac Phoenix, two dr. sedan, four cyl., AM/FM, air, PB, PS, excellent condition, economical, \$2,400. Call 482-3069.

1968 Volvo 142, 4 spd., needs clutch but runs, best offer. Call Butch Cockrell, x6181.

1978 AMC Matador, AC, PS, PB, AM/FM, 65K miles, no rust, excellent condition, \$1,200. Call Humberto Sanchez, x4028 or 996-0401 evenings.

1972 Lincoln Mark IV, beautiful, garaged and no rust, leather seats, good tires, only \$3,280. Call 488-5564.

1978 Ford Fairmont, four dr., 302 engine, new timing chain, fair body, runs well, 89K miles, \$675 firm. Call Ed 488-7050.

1980 Honda Accord, four dr., air, 51K miles, extra clean, \$4,500. Call 532-1728.

1980 Honda Civic, 30K miles, excellent condition, \$3,500. Call 280-8033.

1984 Mustang LX convertible, light blue w/dark blue top, like new, 10,500 miles. Call Ms. Silva, 534-3843.

1971 MG Midget convertible, runs well. Call Alfred, x4183 or 333-2397 after 4 p.m.

## Boats & Planes

Glastron boat and trailer, I.O., 21' 4", walk through windshield, new fuel tanks, engine, outdrive, all working parts, power winch, tandem wheels, good condition. Call 623-1623.

18 ft. boat, 185 h.p., merc. motor, galvanized trailer, \$2,900. Call Joan, x3057 or 486-1058 after 4:30 p.m.

Chris Craft 1986 cabin cruiser, 28 ft., twin screw, sleeps 4, AC, motors perfect, \$4,000. Call 941-0575.

Pearson 26 ft. sailboat, ten h.p. electric start, five sails incl. spinnaker, Bimini, VHF, many acc., full cruiser, racer, black book \$24,000, sell for \$18,000. Call John, 486-9500 or 556-6312.

Formula, 23 ft. twin outdrives, new Loran C. tandem trailer just rebuilt, VHF AC, \$8,000. Call H. C. Waite, x4241 or 332-2983 evenings.

## Bikes

1982 BMW motorcycle, AM/FM/cassette, full fairing, hard luggage bags, low mileage, B.B. \$5,035, sell for \$4,000 OBO. Call 532-4316.

1971 Honda CB450, 2,400 actual miles, wixom fairing, crash bars, carrier, mint condition, \$1,100. Call 486-9335.

1972 Honda CL350, a rare breed. Call 554-5134 after 3 p.m.

1979 Honda XL-500s (Enduro), street legal, current tags, 14K miles, runs but needs some work, great trail and beach bike, \$500 firm. Call Ed, 488-7050.

Ten speed bicycle, needs tires, minor repairs, \$30 OBO. Call Kaye, x5222 or 585-3570.

Boys 24 inch ten speed bike, new seat, cables, paint and housing, recently replaced rear derailleur, looks new, \$50. Call Pat, 280-3519 or 482-8233 after 5 p.m.

1976 Honda 750 four, low miles, garage kept, new tires, battery and muffler, \$850 OBO. Call Wally, x2217.

1981 Kawasaki CSR305, excellent condition, 4,000 miles, \$600. Call 488-3819 evenings.

Boys bike, 20 inch wheel, \$25; small tricycle, \$5. Call 333-3382.

1971 Fabuglas 125 Johnson outboard boat, needs work. Call 485-1931 after 6 p.m.

1978 Honda XL175 on/off road MC, runs well, dependable. Call Alfred, x4183 or 333-2397 after 4 p.m.

Men's 12 speed bike, brand new, royal blue Firenze. Contact Denise, x4183 or 337-3600 after 6 p.m.

1983 Honda 750 Interceptor, 5,800 miles, garage kept. \$2,500 negotiable. Call 280-8033.

## Audiovisual & Computers

VIC-20 computer, cassette player, games, excellent condition, \$60. Call Anthony, 486-0205.

TRS-80 model 4 computer with two disk drives, traction feed printer & stand, 35 blank disks, RS232 modem, disk holders, SuperScriptit & training tapes, some software. Call Ray, x6327 or 554-5434.

Yamaha PS-6100 synthesizer with five octaves, many features including transposer, mini-interface and programmable rhythm, includes stand and pedal, \$1,100. Call Ron, x3035 or 480-8076 after 5 p.m.

Apple II monitor, \$175; Hayes micro-modem IIe (internal) for the Apple IIe, \$190. Call Jeff, x4021 or 488-2405 after 6 p.m.

IBM PC Jr. 128K, internal modem, disk drive, RGB monitor, two keyboards, DOS 2.1, runs most PC software. Call Pat, 280-2273 or 481-2008.

Zenith color 25" TV Mediterranean, dark walnut cabinet with two speakers, five years old, good condition, \$150. Call Elaine, x3083 or 326-2402 after 5 p.m.

Magnavox stereo-console, beautiful cabinet with AM/FM stereo and turntable. \$100. Call Derrill, 280-2276 or 333-2874.

Dot matrix printer with serial interface card, \$100. Call Don, 554-7706.

## Wanted

Roommate to share 3-2-2 in Friendswood, cable TV, \$250 plus 1/2 bills. Call Beto, x4028 or 996-0401.

Housemate to share 5-4-3 in Friendswood, fully furnished, W/D, cable T.V., microwave, hot tub, \$225/mo. includes utilities. Call Rowena, x4621 or 996-9249.

Refrigerator and stove in good condition. Call Sharon, x5212 or 337-7096.

Roommate, two miles to NASA, non-smoker, \$225 and share utilities. Call 474-7481.

Roommate to share 3-2-2 in League City, m/f, professional, community pool, tennis courts, W/D, \$285/mo. ABP. Call Steve Nelson, 280-4243.

Three month old infant looking for a loving, entertaining babysitter, starting in June, easy baby, hours flexible, Seabrook area. Call Jim, x4513 or 474-4506.

Inexpensive used girls bike for casual touring with toddler. Call Tandri, x2381 or 474-4506.

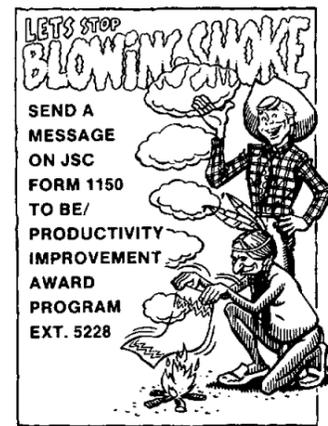
Housemate to share 3-2-2 in League City, m/f, \$190/mo. plus utilities. Call 554-7706.

Roommate to share three BR home with two others, Webster area, \$200/mo. plus utilities. Call 333-6735.

Back issues of "Dragon" magazine, (Nos. 1-60). Call W. Koop, x7484 or 486-8753 evenings.

Beginner or general purpose windsurfer. Call 474-3319.

Two housemates to share 3-2-2, five miles from NASA, two partially furnished bedrooms and full house privileges, private boat launch and park, \$250/mo. plus 1/3 utilities. Call Scott, 333-7448 or 532-1116.



## Household

Sofa, two-piece, L-shaped, dark beige, \$400; swivel, high back rattan chair, \$100. Call 487-1883 after 5 p.m.

Walnut TV stand, five ft. tall includes roll out turntable base, lower cabinet for records, like new, \$75. Call 488-3819 evenings.

19.6 cubic ft. upright Sears Best Kenmore frostless freezer, excellent condition, white, \$300 or trade for refrig./freezer of equal value. Call Dottie x4794.

Victorian DR, table with four chairs, buffet, china cabinet, \$850. Call 280-6978 or 409-948-2133 after 5 p.m.

Sears 15.1 cubic ft. chest freezer, two yrs. old, excellent condition, \$300. Call Barbara or Mike, x2383 or 482-0626 evenings.

Supersingle waterbed, 14 yr. warranty mattress, bookcase, headboard, excellent condition, \$100. Call Janice, x5867 or 482-6888.

GE dishwasher with spare parts, \$30. Call 333-3382.

Eureka upright, runs but needs help, with attachments, best offer over \$20. Call Richard, 280-6669.

Microwave stand, cabinet type, \$40; wall unit bookcase, \$40; Lloyd's stereo, turntable and speakers, \$100. Call 485-1931 after 6 p.m.

Full size bed/mattress, box springs, frame, fair condition, \$50 OBO. Call Steve, x5589 or 480-2538.

Pre-1945 refrigerator in working condition, compressor on top. Call Ray, x5257 or 554-2908 after 5:30.

Solid maple butcher block table tops and birch chairs. Call Ray, x5257 or 554-2908.

Chest of drawers, two years old, \$125 new, sell for \$65. Call 482-2847.

Square drop leaf breakfast table, 3 x 3, and two chairs, good condition, \$100 OBO. Call Mary, x2001 or 532-4257 after 5 p.m.

Freezer, \$125; refrigerator, \$50, both work. Call 482-1546.

G.E. refrigerator, perfect for garage, never had a problem, \$75. Call 480-3565.

Stanley bedroom group, bed w/mattress and box springs, dresser w/mirror, desk, chair, bookcase, ideal for girl's or guest room, \$450. Call Dean, x6545 or 486-5331 after 5 p.m.

G.E. refrigerator, side-by-side, 22 cubic ft., \$375. Call 480-3552 after 5 p.m.

## Pets

Free kittens, eight weeks old. Call 481-2935.

AKC boxer @ stud, fawn with white markings, champion bloodline, \$150. Call Clyde, x2482.

AKC registered chow, one year old female, spayed, affectionate, outdoor

dog but trained to stay in kitchen, \$95. Call Jerry, x3561.

Siberian husky/Labrador pups, 7 weeks old, two females, black and white, first shots and worming. Call Steve, x5589 or 480-2538.

## Miscellaneous

Rent my motor home by day or week, self-contained with onboard generator, roof air, the comforts of home on wheels. Call Dave, x5111 or 480-0202 after 6 p.m.

Self-propelled Jacobson lawnmower, 8.5 h.p. large wheel model, consider trade for garden tiller. Call 554-2065 after 4 p.m.

Black, tubular rear sport dumper for import truck, \$85. Call Walt, x3481.

Missouri City, Alief, Memorial car pools interface with metros Meyerland to NASA van pool, \$49.95/mo. Call Richard Heetderks, x4651.

Two Genie AT-79 garage door opener transmitters, 32.5 megahertz, new, \$45. Call Sai, x5435.

Misc. bike parts for two regular and two ten-speed men's and ladies bicycles, frames all good, \$20 takes all. Call John Dornbach, 326-3459.

IBM electric typewriter with extra ribbons, \$165; 100 National Geographic, \$25; AC-DC black and white TV, new, \$80, hand-built sailing vessel display, \$45; two metal four-tier shelves, \$20 for both. Call 488-5564.

Small desk, 20 x 40, three drawers, \$20; Dynaco stereo FM tuner, \$30. Call Jim Bates, x4614.

Pool table, Sear's full size model, \$150. Call 488-0035.

Upright piano by Cable, excellent condition, \$385. Call Keyes, 333-2132.

Chevy 230 CID engine with dual headers, make offer; Minnkota trolling motor, \$25; Coleman tent, \$40. Call Ted, 482-8827.

Two P185/75R14 all season BF Goodrich steel-belted, radial, white wall tires, 17,500 miles, excellent condition, \$50/pr OBO. Call Patty, x5104.

1981 Chrysler motor, 25 h.p., excellent condition, \$450. Call Hank, x4107 or 996-9033.

Dog pen, 20' x 30' x 4', heavy duty chain link, includes posts, gate, necessary hardware. Call Art, 486-1350 or 333-4458 after 5 p.m.

Antique Estey pump organ, beveled mirror, beautiful original finish, high back or swivel stool, \$2,000; practice piano, \$200. Call Dianna, x2868 or 474-5759.

235 Chevy engine, dual Offenhausers with headers, make offer. Call Lapko, 482-8827.

Exercise bicycle, \$40; infant car seat, \$15; Hagstrum acoustical guitar, \$50. Call 480-8021.

Windsurfers: BIC, \$400; sailboard, \$500. Call Derrill, 280-2276 or 333-2874.

Babysitting in my home or yours, two-three full days per week. Call Anne, x6557 or 474-7020.

IBM typewriter, \$75. Call Wanda, 474-3228.

Classic sheepskin seat covers for high-back bucket seats (used six months), \$75. Call Wanda, 474-3228.

Signet oboe, excellent condition, \$550. Call Amy, x2651 or 486-6738 evenings.

Secretarial desk with pull-out typewriter tray on left, large middle drawer, three side drawers on right w/station